Paper No. 29

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte MASAO SASAKI and KIYOHIKO FUNATO

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Appeal No. 2001-0118
Application No. 09/013,927

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HEARD: May 8, 2002

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Before GARRIS, JEFFREY T. SMITH, and MOORE, Administrative Patent Judges.

GARRIS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the final rejection of claims 2 and 4 which are all of the claims remaining in the application.

The subject matter on appeal relates to an ionizing sputtering method comprising the steps of maintaining an

inside of a sputter chamber at a pressure between 20 and 100 milliTorr and applying a high frequency electric power to a target provided inside the sputter chamber to release sputter particles from the target, wherein the sputter particles are ionized only by the high frequency electric power applied to the target in a plasma formed by the sputter discharge.

Further details of this appealed subject matter are set forth in representative independent claim 2 which reads as follows:

2. An ionizing sputtering method, comprising the steps of:

maintaining an inside of a sputter chamber at a pressure between 20 and 100 mTorr;

applying a high frequency electric power to a target provided inside the sputter chamber so as to create a sputter discharge and sputter said target to release sputter particles from the target, wherein the sputter particles are ionized only by the high frequency electric power applied to the target in a plasma formed by the sputter discharge; and

making the sputter particles released from the target arrive at a substrate so as to build up a thin film on a surface of the substrate;

wherein a power area density of the high frequency electric power divided by a surface area of the target being sputtered is a least 5 W/cm^2.

The references set forth below are relied upon by the examiner as evidence of obviousness:

Lubbers et al. (Lubbers)	4,217,194	Aug. 12, 1980
Jeffrey et al. (Jeffrey)	4,353,788	Oct. 12, 1982
Barnes et al. (Barnes)	5,178,739	Jan. 12, 1993
Fritsche	5,300,205	Apr. 5, 1994

Rossnagel et al. (Rossnagel), "Metal ion deposition from ionized mangetron sputtering discharge," J. Vac. Sci. Technol. B, Vol. 12, No. 1, pp. 449-453 (1994).

Claim 2 stands rejected under 35 U.S.C. § 103 as being unpatentable over Barnes in view of Jeffrey, Lubbers and Fritsche, and claim 4 stands correspondingly rejected over these references and further in view of Rossnagel.

On page 3 of the answer, the examiner refers to "prior Office action, Paper No. 17" for his exposition of these rejections. Our study of Paper No. 17, which is the final Office action, reveals that the examiner advanced therein two separate theories in support of his position that Barnes teaches or would have suggested the here claimed applying step wherein "the sputter particles are ionized only by the high frequency electric power applied to the target." In one theory, the examiner concludes that it would have been obvious to modify patentee's embodiment which uses an rf coil by simply eliminating this coil because the rf coil "is merely extra" (Paper No. 17, page 2 and page 8). In the other

theory, the examiner contends that, in the paragraph bridging columns 5 and 6 of the patent, "Barnes . . . teaches ionizing the sputter particles solely by the use of the power applied to the target" (Paper No. 17, page 8).

Notwithstanding the examiner's reference on page 3 of the answer to Paper No. 17 for an exposition of his section 103 rejections, subsequent portions of the answer clearly reflect that the examiner no longer relies upon either of his above discussed theories as support for a conclusion of obviousness. For example, in the first full paragraph on page 4 of the answer, the examiner acknowledges that "[i]t is probably incorrect to state that the coil . . . of Barnes is 'merely extra' as the examiner has previously argued" and that "[t]he coil in Barnes does in fact provide power that ionizes sputter particles." Regarding his theory involving the disclosure in the paragraph bridging columns 5 and 6 of Barnes, the examiner responds to the arguments in the brief concerning this theory by stating that "Appellant is [sic] correct" and that "[t]he examiner had improperly interpreted the section of Barnes [from column 5, line 61 to column 6, line 6]" (answer, page 8).

In place of these discarded theories, the examiner presents in his answer a new theory to support his obviousness conclusion regarding the "applying" step of appealed independent claim 2. This new theory involves "traditional rf sputtering" and is described on pages 5 and 6 of the answer with the following language:

> As noted above, the coil **(16)** in Barnes is necessary to better ionize sputter particles so that high aspect ratio holes can be filled. Traditional rf sputtering does not utilize a coil. It can then be reasonably stated that a substrate that does not have high aspect ratio holes (i.e. a plain flat substrate) would not need the coil because there are no holes to fill in the substrate. Of course, eliminating the coil involves losing the benefit of utilizing the coil (namely, to provide better ionization), but the court has held that a component can be eliminated with a corresponding loss of benefit. *In re Kuhle,* 526 F.2d 553, 188 USPQ 7 (CCPA 1975). In this case, the corresponding loss of benefit would be the loss of filling high aspect ratio holes. In other words, traditional rf sputtering without a coil on a plain substrate would occur. Therefore, in the traditional rf sputtering, ionized sputtering would occur with the power applied solely to the target. This fact has not been disputed by Appellant and in fact has been admitted by Appellant (Brief pages 19-20).
>
> Appellant has made no claim to the level of ionization that must occur. Therefore, a minuscule amount of ionization (which will occur [in] traditional rf sputtering as stated in Barnes and admitted by Appellant) will meet the limitation of claim 2. Appellant is correct to say that

> traditional rf sputtering will not achieve a proper ionization level to fill high aspect ratio holes (Barnes in fact states this premise), but Appellant has ignored the fact that traditional rf sputtering will ionize, just not enough to fill the holes. If there are no holes to fill, then there is no need for further ionization. Therefore, traditional rf sputtering onto a plain substrate will involve ionization by power applied solely to the target and meet the limitations of claim 2. In traditional rf sputtering, the coil of Barnes would be merely extra.

We here clarify that our assessment of the section 103 rejections advanced by the examiner on this appeal does not include consideration of the first two theories discussed above. The examiner has made it clear in his answer that he no longer relies upon these theories. Under these circumstances, it is appropriate to confine our assessment of the rejections to the "traditional rf sputtering" theory since this is the only theory now proffered by the examiner as supporting his conclusion that the here claimed "applying" step would have been obvious.

OPINION

On the record of this appeal, it is clear that the examiner's section 103 rejections cannot be sustained.

The fundamental position expressed by the examiner in his answer is that it would have been obvious to modify Barnes by

removing the rf coil in order to practice "traditional rf sputtering," thereby resulting in a method of the type defined by the independent claim on appeal. As correctly explained by the appellants in the reply brief, the deficiency of this position is the examiner's implicit assumption that modifying the Barnes process in order to practice "traditional rf sputtering" would involve only the removal of patentee's rf coil. That is, the examiner implicitly assumes that an artisan, in making the proposed modification of Barnes, would have eliminated the rf coil but left unchanged all other aspects of patentee's method. This assumption is incorrect.

For example, it is implicitly assumed by the examiner that patentee's sputter chamber pressure, which overlaps the here claimed pressure, would remain the same after modifying Barnes for "traditional rf sputtering." However, the disclosure at lines 43-57 in column 4 of Barnes teaches that patentee's range of relatively high pressures enhances the ionization desired by Barnes. In contrast, as detailed by the appellants in the reply brief, the secondary reference to Lubbers discloses a sputtering process which (like "traditional rf sputtering") is not concerned with ionization

and which uses a sputter chamber pressure far below those disclosed by Barnes and claimed by the appellants (e.g., see lines 37-41 in column 13 of Lubbers).

The relatively high pressures disclosed by Barnes (to effect sputtering with high ionization) in comparison with the relatively low pressure disclosed by Lubbers (to effect sputtering without any significant ionization) compel a determination that the examiner's proposal to modify Barnes so as to result in "traditional rf sputtering" (i.e., sputtering without significant ionization) would result in use of a sputter chamber pressure (e.g., the pressure of Lubbers) far below those required by the independent claim on appeal. Therefore, even assuming an artisan with ordinary skill would have been motivated to modify Barnes in order to obtain "traditional rf sputtering," such a modification would result in a method different from the appellants' claimed method in at least one respect (i.e., sputter chamber pressure).

For this reason alone, we cannot sustain the examiner's section 103 rejection of claim 2 over Barnes in view of Jeffrey, Lubbers and Fritsche or his corresponding rejection

of claim 4 over these references and further in view of Rossnagel.

The decision of the examiner is reversed.

REVERSED

Bradley R. Garris Administrative Patent Judge	)	
Jeffrey T. Smith Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
James T. Moore Administrative Patent Judge	)	

BRG:tdl

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